

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re

U.S. application of: Akira TSUBOUCHI, Kiyoshi OKUBO and
Yasushi WATANABE

For: METHOD FOR MANUFACTURING A
HOLLOW RACK SHAFT

U.S. Serial No.: To Be Assigned

Confirmation No. To Be Assigned

Filed: Concurrently

Prior Application:

U.S. Serial No.: 09/803,560

Confirmation No.: 7306

Filed: March 9, 2001

Group Art Unit: 3726

Examiner: Marc Quemuel Jimenez

MAIL STOP PATENT APPLICATION

Commissioner for Patents

P. O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

EXPRESS MAIL MAILING LABEL NO.: EV 411784203 US
DATE OF DEPOSIT: MARCH 11, 2004

I hereby certify that this paper or fee is being deposited with the
United States Postal Service "Express Mail Post Office to
Addressee" service under 37 C.F.R. § 1.10 on the date indicated
above and is addressed to MAIL STOP PATENT APPLICATION,
Commissioner for Patents, Alexandria, VA 22313-1450.

DERRICK GORDON

Name of Person Mailing Paper or Fee



Signature


MARCH 11, 2004

Date of Signature

SUBMISSION OF SUBSTITUTE SPECIFICATION

OK to enter
In accordance with MPEP § 608.01(q), a marked specification is provided
herewith. The substitute specification is a true and accurate reproduction of the text of
the original specification and includes each of the modifications indicated within the
marked specification. The substitute specification does not include any new matter.

METHOD FOR MANUFACTURING A HOLLOW RACK SHAFT



[0001] This application is a divisional of co-pending U.S. Patent Application Serial No. 09/803,560, filed March 9, 2001, ^{now Patent No. 6,845,560,} which is based on Patent Applications No. 2000-64298, No. 2000-114306 and No. 2000-114502 filed in Japan, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] This invention relates to a hollow rack shaft, and more particularly to a method for manufacturing a hollow rack shaft for a steering system used in an automobile.

2. Description of the Related Art

[0003] In the case of a rack-and-pinion type steering system for an automobile frequently used in the automotive industry, the rotation of a steering wheel operated by a driver is transmitted to a pinion. The rotation of this pinion is transmitted to a rack shaft engaged with the pinion and this is converted into a motion in a lateral direction (a longitudinal direction of the rack). Since the rack shaft is connected to a steering rod, the direction of the front wheels is changed by the lateral motion of the rack shaft. Since such a steering mechanism as described above is well known in the art, further description will be excluded.

[0004] The aforesaid rack shaft has been attained by gear cutting on a solid, namely not hollow, material. In recent years, as already described in Japanese Laid-Open Patent No. Hei 6-246379, Japanese Laid-Open Patent No. Sho 58-218339 (Japanese Patent Publication No. Hei 4-028582) and Japanese Laid-Open Patent No. Hei 11-180318, fuel efficiency of an automobile has been improved by making a hollow rack shaft to attain a more light weight rack shaft.